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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/713,176	11/14/2003	Bryan M. Cantrill	03226.340001; SUN040170	7068

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EXAMINER	
WALTER, CRAIG E	
ART UNIT	**PAPER NUMBER**
2188	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/31/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/713,176	CANTRILL, BRYAN M.	
	Examiner	Art Unit	
	Craig E. Walter	2188	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 November 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 15 November 2006 has been entered.

Status of Claims

2. Claims 1-29 are pending in the Application.

Claims 1, 8, 11, 15, 18 and 27 are amended.

Claims 1-29 are rejected.

Response to Amendment

3. Applicant's amendments and arguments filed on 15 November 2006 in response to the office action mailed on 15 August 2006 have been fully considered, but they are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-7, 9-10, 12-17, and 19-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burton et al. (US Patent 6,874,074 B1) hereinafter Burton, in further view of Bunnell (US PG Publication 2002/0199172 A1), in further view of Ellis et al. (US Patent 5,088,036), hereinafter Ellis.

As for claim 1, Burton discloses a method of dynamically allocating a variable in a tracing framework, comprising:

allocating dynamic memory having a plurality of data chunks; [(resources may be allocated dynamically) column 1, lines 30-45];

placing at least one of the plurality of data chunks onto a free list; [(free memory table) column 3, lines 46-48];

allocating the at least one of the plurality of data chunks on the free list to store the variable and removing the at least one of the plurality of data chunks from the free list; [(a gray object may be a memory object in use and should not be reclaimed) column 7, lines 1-22];

de-allocating the at least one of the plurality of data chunks and placing the at least one of the plurality of data chunks on a dirty list; and [(allocated memory table to reflect allocation of memory) column 4, 6-14]; and

cleaning the at least one of the plurality of data chunks on the dirty list using a cleaning procedure to place the at least one of the plurality of data

chunks on the free list. [(garbage collector reclaims memory objects by adding them to a free memory table) column 4, lines 46-67].

Despite his disclosure, Burton neither teaches encountering an enabled probe of an instrumented program, nor performing an action associated with the enabled probe, based on encountering the enabled probe, wherein the variable is associated with the action.

Bunnell however teaches a dynamic instrumentation event trace system and method wherein trace points are inserted within the program code perform dynamic instrumentation within a tracing framework. More specifically, these trace points correspond to the beginning of predefined program functions selected for event tracing. In other words, the system will perform predefined functions (i.e. actions) in response to encountering a trace point (i.e. probe) within the code – paragraph 0014, all lines. Bunnell additionally discloses utilizing a trace driver including control routines, which are used to dynamically allocate buffer space to store instructions necessary to preserve the execution integrity of a particularly named function – paragraph 0038, all lines.

Additionally, though Burton teaches allocating dynamic memory, he fails to specifically teach the dynamic memory as comprising first dynamic memory from a first processor and second dynamic memory from a second processor as recited in this claim.

Ellis however teaches a real time, concurrent garbage collection system and method, implemented by utilizing multiple heaps, each of which is associated with its own processor (Fig. 4, col. 11, line 54 through col. 12, line 12).

It would have been obvious to one of ordinary skill in the art at the time of the invention for Burton to further include Ellis's real time concurrent garbage collection system and method into his own memory reclamation system. By doing so, Burton would be able to exploit the benefits of Ellis's garbage collector which include a lower cost synchronization system, paired with increased mutator operation speed as taught by Ellis in col. 5, lines 21-31.

As for claim 2, Burton discloses the method of claim 1, further comprising:

associating the dynamic memory with a consumer dynamic memory state. [(procedure may use marks to indicate status of memory objects) column 6, lines 55-65].

Burton fails to teach the consumer dynamic memory state as being associated with a tracing consumer, wherein the tracing consumer is associated with the tracing framework.

Bunnell however teaches a dynamic instrumentation event trace system and method wherein trace points are inserted within the program code perform dynamic instrumentation. More specifically, a trace environment is used to capture event data in order to trace the executing state of a program. A trace data collector is then used to trace data dynamically during program execution (paragraphs 0029 through 0030, all lines).

As for claims 12 and 19, though Burton discloses the dynamic memory as being associated with a consumer [(pool of dynamic memory shared by a group of user tasks)

column 3, lines 53-66], he fails to teach the tracing consumer as being associated with the tracing framework.

Bunnell however teaches Bunnell however teaches a dynamic instrumentation event trace system and method wherein trace points are inserted within the program code perform dynamic instrumentation. More specifically, a trace environment is used to capture event data in order to trace the executing state of a program. A trace data collector is then used to trace data dynamically during program execution (paragraphs 0029 through 0030, all lines).

It would have been obvious to one of ordinary skill in the art at the time of the invention for Burton to further include Bunnell's dynamic instrumentation event trace system and methods into his own system and method for memory reclamation. By doing so, Burton would be enabled to exploit the benefits of detection and causal analysis of failure sources in his own software routines (Bunnell – paragraph 0004, all lines). More specifically, Burton could benefit from Bunnell's system by having a means of supporting dynamic instrumentation of an executing or executable program, which would enable him to exploit the benefits of tracing without the need for advance preparation or modification of the program as discussed by Bunnell in paragraph 0015, all lines.

As for claim 3, Burton discloses the method of claim 2, further comprising:

setting the consumer dynamic memory state after searching for the at least one of the plurality of data chunks to allocate [(after being visited by the

garbage collection procedure, a memory object may be marked) column 7, lines 1-22].

As for claim 4, Burton discloses the method of claim 2, wherein the consumer dynamic memory state is set to empty if all of the plurality of data chunks are allocated [(a white mark may denote an object not in use) column 7, lines 1-22].

As for claim 5, Burton discloses the method of claim 2, wherein the consumer dynamic memory state is set to dirty if all of the plurality of data chunks are either allocated or on the dirty list [(newly allocated marks may be marked gray) column 7, lines 1-22].

As for claim 6, Burton discloses the method of claim 2, wherein the consumer dynamic memory state is set to rinsing if all of the plurality of data chunks are either allocated or on a rinsing list [(a referenced flag to be indicative of whether a memory object is available for reclamation) column 13, lines 19-31].

As for claim 7, Burton discloses the method of claim 2, wherein the consumer dynamic memory state is set to clean after executing the cleaning procedure [(a scanned flag to indicate garbage collector has completed its processing of memory object) column 13, lines 32-45].

As for claim 9, Burton discloses the method of claim 1, further comprising:

querying a clean list for one of the plurality of data chunks if the free list is empty; and [(allocator may search a table of free memory to identify a portion of available memory) column 11, lines 61-67]; and

moving one of the plurality of data chunks from the clean list to the free list if the clean list is not empty. [(deleting a memory object's entry and updating the free memory table to include the memory object's portion of memory) column 12, lines 19-33].

As for claim 10, Burton discloses method of claim 1, further comprising:

determining whether the variable has been previously allocated; and [(entries tested to determine whether the entry is a pointer) column 7, lines 50-67); and

not allocating the variable if the variable has been previously allocated. [(may release memory that has been preciously allocated) column 4, lines 31-46].

As for claim 13, Burton et el discloses the method of claim 1, wherein a size of the at least one of the plurality of data chunks is static [(resources may be allocated to a task statically) column 4, lines 13-30].

As for claim 14, Burton discloses the method of claim 1, wherein the dynamic memory is indexed using a hash table [(memory allocation entries may be stored in hash table) column 13, lines 1-7].

Claims 15, 27 are a combination of the limitations of claims 1 and 2, and therefore stand rejected with same rationale.

Claims 16, 17, 20, 28, and 29 are rejected with the same rationale as claim 1.

Claims 21-26 are rejected with the same rationale as claim 3-7, and 14 respectively.

5. Claims 8, 11, and 18 are rejected under 35 U.S.C 103(a) as being unpatentable over the combined teachings of Burton (US Patent 6,874,074 B1), Bunnell (US PG Publication 2002/0199172 A1) and Ellis (US Patent 5,088,036) as applied to claims 7, 1, and 17 above respectively, and further in view of Dussud (US Patent 6,622,226 B1).

As for claim 8, Burton does not disclose expressly a cleaning procedure comprising:

> moving one of the plurality of data chunks from the dirty list to a rinsing list if dirty list is not empty; issuing a first cross-call; moving one of the plurality of data chunks from the rinsing list to a clean list if the rinsing list is not empty upon receiving a response to the first cross-call; issuing a second cross-call; and setting the consumer dynamic memory state to clean in response to the second cross-call. However, Dussud discloses a method including traversing memory objects referenced by a program; marking the memory objects reached; adding the memory objects reached to a mark-list; detecting if the mark-list is full; and if the mark-list is not full; avoiding traversing the unmarked memory objects during the sweeping of the memory objects, and reclaiming the memory objects not marked. (column 2, lines 29-45)

It would have been obvious to one of ordinary skill in the art at the time of the invention for Burton to further include Dussaud's method and system for garbage collection his own system and method for memory reclamation. By doing so, Burton would be enabled to exploit the benefits of a faster memory reallocation process as taught by Dussud in column 2, lines 9-26.

Additionally, though the combined teachings of Burton, Bunnell and Dussud teach issuing first and second cross-calls (see the rejection of claim 8, *supra*), they fail to specifically teach issuing the cross-calls to both a first and second processor.

Ellis however teaches a real time, concurrent garbage collection system and method, implemented by utilizing multiple heaps, each of which is associated with its own processor (see Fig. 4). Ellis further teaches this multiple processor, multiple heap system as being viewed as partitions of a single heap, hence commands are received by this system as if it were a single processor, single heap system - col. 11, line 54 through col. 12, line 12.

It would have been obvious to one of ordinary skill in the art at the time of the invention for Burton in further view of Bunnell in further view of Dussud to further include Ellis's real time concurrent garbage collection system and method into his own memory reclamation system. By doing so, Burton would be able to exploit the benefits of Ellis's garbage collector which include a lower cost synchronization system, paired with increased mutator operation speed as taught by Ellis in col. 5, lines 21-31.

Claims 11 and 18 are rejected with the same rationale as claim 8.

Response to Arguments

6. Applicant's arguments with respect to claims 1, 8, 11, 15, 18 and 27 have been considered but are moot in view of the new ground(s) of rejection necessitated by amendment.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Craig E. Walter whose telephone number is (571) 272-8154. The examiner can normally be reached on 8:30a - 5:00p M-F.

8. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hyung S. Sough can be reached on (571) 272-6799. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

9. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Craig E Walter
Examiner
Art Unit 2188

CEW

HYUNG SOUGH
SUPERVISORY PATENT EXAMINER
1-30-07